

Chapter 2 – Future Land Use, RA Evaluation Units and Identification of COPCs

2.1 Introduction

The purpose of this Chapter is to identify the future land uses for the Site, delineate evaluation units (EUs), identify media of concern, and to identify COPCs that will be evaluated further in the risk assessment.

2.2 Future Land Use

In October 1999, Weyerhaeuser Company and WRECO filed a Declaration of Restrictive Covenant that specifies allowable land uses for the Site. The Restrictive Covenant was filed with the Pierce County Auditor (document no. 9910290750) and states that none of the property shall be developed or used for residential uses, schools, daycare facilities, parks or other recreational uses – with the exception that the golf course and related amenities shall be allowed. These restrictions on land uses apply to the current landowners and all future landowners, unless determined otherwise in a legal venue and with Ecology's approval.

Future Site use, according to the Final Environmental Impact Statement (Ecology, 2000), will include commercial, golf course, historical, industrial and open space uses (See Figure 2-1). North of Sequatchew Creek is planned for industrial use and open space. South of Sequatchew Creek is planned for mixed use. Most of the Site will undergo changes during development, including grading, paving, placement of buildings, addition of topsoil, soil amendments, and landscaping. Future Site use plans, as reflected in this RA, enable an assessment of potential future risk.

2.2.1 Commercial

The majority of the Site property will be used for commercial purposes such as offices and retail businesses. The majority of the soil in this area will be covered by buildings, parking lots, and roads. Areas that are not covered by a building or parking lot will have sidewalks and professionally maintained, landscaped areas. These landscaped areas will be prepared for planting by adding imported topsoil, plants, and shrubs. A layer of mulch, or similar cover, will be added for aesthetic and practical purposes (e.g., weed control). Figure 2-1 identifies the commercial land use areas that comprise approximately 336 acres.

2.2.2 Golf Course

Ecology has agreed that a golf course facility is compatible with the planned future use of the Site (Ecology, 2000). A golf course serves as an effective means to isolate soil on the Site that is contaminated with lead or arsenic. The golf course layout was designed in order to maximize coverage of areas that have elevated soil arsenic and lead concentrations. The golf course, presented in Figure 2-1, covers approximately 187 acres.

2.2.3 Historical

Three historical areas have been identified on the Site, including the Fort Nisqually Cemetery (45PI404), the Shell Midden (45PI72), and the 1833 Fort Nisqually Site (45PI155). The historical areas consist of approximately 4 acres. The location of each of these areas is identified in Figure 2-1.

2.2.4 Industrial

The area north of Sequatchew Creek will be used for industrial purposes. Industrial use may include activities ranging from mining gravel to development of light industrial facilities. This area occupies 36 acres and is identified in Figure 2-1.

2.2.5 Open Space

A number of areas on the Site will be used for open space. The open space area north of Sequelitchew Creek encompasses the creek and the former NGR bed leading down to Puget Sound. The open space area south of Sequelitchew Creek borders the creek and extends to the northern most portion of the consent decree boundary. The area surrounding Old Fort Lake has also been designated as open space. The open space areas comprise approximately 73 acres, 22 acres of which is the lake itself. The location of each of these areas is identified in Figure 2-1.

2.3 Identification of Evaluation Units

The RI Report presents data by RI Areas. For the purposes of the RI, the Site was separated into different areas based on former production activities or other related activities that may have resulted in releases of COPCs to the environment. For the RA, the Site has been separated into different EUs based on future land use. Figure 2-3 presents both the RI areas and RAs for comparison. In addition, Appendix B of the RA presents the sample numbers for each EU and identifies their associated RI Areas.

The EUs were derived based on future land uses of the Site and were approved by Ecology. Future land use areas such as the historical and open space areas, that are relatively small in size, were evaluated without further division. The industrial land use area also was not divided. The commercial and golf course areas were subdivided into smaller EUs using the following decision rules:

- EUs should be similar in size.
- EUs should consist of contiguous property.
- EU boundaries should take into account potential remedial alternatives. For example, the commercial area on the bluff overlooking Puget Sound would require a different remedial approach than the rest of the Site due to the topography. Therefore, this area was designated, as its own EU. Other small EUs include the 65-foot commercial buffers, which are on the southern, southeastern, and eastern borders of the Site. These areas may be left in their current state as a buffer, depending on the results of the RA.
- EUs for the Golf Course should be divided between groups of golf holes.

The RA EUs are presented in Figure 2-3 and the number of acres for each EU is summarized in Table 2-1.

2.4 Potentially Affected Media

Potentially affected media at the Site include surface soil (0-1 foot below ground surface [BGS]), subsurface soil (1 foot to 15 BGS), subsurface soil (greater than 15 feet BGS), surface water (Old Fort Lake and Sequelitchew Creek), sediment (Old Fort Lake and Sequelitchew Creek), and groundwater. Based on the historical RI, preliminary and draft RAs, and ecological evaluations, it was determined that levels of COPCs in surface water and sediment were not of concern for protection of human and ecological receptors. Therefore, Ecology determined that no further action was warranted for these media (for more details see the RI Report, Volume I). Soil and groundwater are discussed below. COPC concentrations in the RI indicated that, other than low DNT concentrations that were detected in 6 wells, groundwater is not a medium of concern. The presence of low levels of DNT in groundwater is addressed in the FS.

The RI identified elevated levels of COPCs in surface and subsurface soil. COPCs are identified for surface and subsurface soil based on frequency of detection and risk-based screening criteria in the following section.

2.5 Identification of COPCs

In an effort to focus the risk assessment on those constituents most likely to pose risk to human and ecological receptors, preliminary screening was performed. This screening was conducted on a Site-wide

basis (e.g., EUs were not screened individually in this step), and consisted of eliminating COPCs that were not detected in any samples, and eliminating COPCs that had maximum detected concentrations that were below conservative risk-based screening concentrations. These screening steps are discussed below.

Data quality has been assessed and is discussed in the RI (See Appendix E). The data review involved verification that chain-of-custody protocols were followed, verification that the laboratory followed its quality assurance program, and an independent evaluation by URS Inc. of any data quality exceptions noted by the laboratory. Although there were some data quality exceptions indicating that some concentrations are estimates, all of the data presented in the RI were deemed of sufficient quality to retain for use in the risk assessment.

2.5.1 Screening of Non-Detected COPCs

Sample results for all COPCs were reviewed, and those constituents that were not detected in any samples were eliminated from further consideration. A total of 38 detected constituents were detected in surface soil and 52 in subsurface soil. A summary of the COPCs detected in surface and subsurface soil is shown in Table 2-2.

2.5.2 Risk-Based Screening of COPCs

In this last screening step, the maximum detected concentrations of COPCs were compared to the most conservative (i.e., the lowest) soil screening concentrations found in MTCA. These screening criteria were based on the direct exposure to soil for both human and ecological receptors.

For protection of human health, based on direct contact exposure pathways with soil, the screening levels for all constituents except lead, gasoline, and total petroleum hydrocarbons (TPH 418.1) were MTCA Method B residential soil concentrations, obtained from Ecology's *Cleanup Levels and Risk Calculation (CLARC) Tables* (Ecology, 2001). These values were chosen because they were the most conservative values found for protection of human health. The screening concentrations for gasoline and TPH 418.1 were obtained from the MTCA Method A tables for soil because there are no corresponding MTCA Method B values. Soil greater than 15 feet BGS was not screened against these values as this depth of soil is not available for human contact.

Surface and subsurface soil COPC concentrations were also compared to MTCA soil screening concentrations that were derived to be protective of groundwater. Even though groundwater monitoring has shown DNT to be the only constituent of concern this screening was performed to identify any areas where leaching of COPCs from soil may potentially impact groundwater. The screening levels used were Ecology's MTCA Method B levels derived for the protection of groundwater, obtained from Ecology's *Cleanup Levels and Risk Calculation (CLARC) Tables* (Ecology, 2001), and Site-specific levels designated for use by Ecology.

Ecology has performed an evaluation of the Site and determined that lead is the indicator compound for potential terrestrial ecological impacts. As part of this evaluation, Ecology determined that, based on site-specific information, the potential species groups of concern included ground-feeding birds and herbivorous small mammals. The soil screening level identified for lead by Ecology is 118 mg/kg, and is intended to be protective of wildlife, including birds and small mammals.

2.5.2.1 Screening Results for Soil-to-Groundwater

Results of this screening step for surface soil are shown in Table 2-3, results for subsurface soil (>1 foot to ≤15 feet bgs) are shown in Table 2-4, and results for deep subsurface soil (>15 feet bgs) are shown in Table 2-5. Based on this screening step, there were 5 COPCs that exceeded the soil-to-groundwater screening criteria in surface soil, 5 COPCs that exceeded the criteria in subsurface soil >1 foot to ≤15 feet BGS, and 3 COPCs that exceeded the criteria in subsurface soil > 15 feet BGS. A summary of the COPCs that exceeded soil-to-groundwater screening criteria is presented in Table 2-6. Groundwater remediation options for these COPCs are presented in the FS and groundwater was not evaluated further in the risk assessment as a medium of concern.

2.5.2.2 Screening Results for Soil

Results of this screening step for surface soil are shown in Table 2-3, and the results for subsurface soil (>1 foot to ≤15 feet BGS) are shown in Table 2-4. Following this screening step, there were 16 COPCs in surface soil that exceeded the screening criteria and 17 COPCs that exceeded the criteria in subsurface soil >1 foot to ≤15 feet BGS.

A summary of these COPCs identified in surface and subsurface soil is shown in Table 2-7. Those constituents that did not have available risk-based screening concentrations were included as COPCs to be carried through to the risk assessment. These constituents are also identified in Table 2-7. Soil samples analyzed for oil and grease (EPA Method 413.2) were excluded from the RA due to the non-specificity of the analysis method. This method measures natural oils and greases in addition to petroleum constituents.

Table 2-1 – Evaluation Unit Size

Evaluation Unit	Acres
Commercial	
CM-01	48.05
CM-02	25.08
CM-03	37.55
CM-04	28.06
CM-05	64.22
CM-06	28.53
CM-07	62.38
CM-08	14.34
CM-09	27.48
Average	37.30
TOTAL	335.67
Golf Course	
GC-01	17.11
GC-02	18.27
GC-03	24.70
GC-04	20.50
GC-05	16.08
GC-06	22.75
GC-07	20.48
GC-08	19.12
GC-09	28.41
Average	20.82
TOTAL	187.42
Historical	
HI-01 - 1843 Fort Site	1.81
HI-02 – Midden	1.91
HI-03 - 404 Site Boundary	0.42
Average	1.38
TOTAL	4.14
Industrial	
Industrial	35.73
Open Space	
OS-01	4.29
OS-02	12.42
OS-03	11.28
OS-04 ⁽¹⁾	45.23
Average	18.30
TOTAL	73.21
Grand Total Acreage for Parcel 1	636.17

Notes:

⁽¹⁾Old Fort Lake comprises 22.35 of the acreage of this EU.

Table 2-2 – Summary of Constituents Detected in Each Depth Interval

Constituent	Soil Depth ≤ 1 Foot BGS	Soil Depth >1 Foot and ≤ 15 Feet BGS	Soil Depth > 15 Feet BGS
Explosives			
Dinitrotoluene, 2,4-	✓	✓	✓
Dinitrotoluene, 2,6-	✓	✓	✓
Monomethylamine Nitrate	--	✓	--
Nitrobenzene	✓	✓	--
Nitroglycerine	✓	✓	--
Trinitrobenzene, 1,3,5-	--	✓	✓
Trinitrotoluene, 2,4,6-	✓	✓	✓
Petroleum Hydrocarbons			
#2 Diesel	--	✓	✓
TPH (418.1) ⁽¹⁾	✓	✓	✓
Gasoline	✓	✓	--
Oil and Grease ⁽²⁾	✓	✓	✓
Inorganics			
Aluminum	✓	✓	✓
Antimony (metallic)	✓	✓	--
Arsenic	✓	✓	✓
Beryllium	✓	✓	✓
Cadmium	✓	✓	✓
Chromium	✓	✓	✓
Copper	✓	✓	✓
Lead	✓	✓	✓
Mercury (inorganic)	✓	✓	✓
Nickel (soluble salts)	✓	✓	✓
Selenium (and compounds)	✓	✓	--
Silver	✓	✓	✓
Thallium	✓	--	--
Zinc and Compounds	✓	✓	✓
PAHs			
Acenaphthene	--	--	✓
Anthracene	✓	✓	✓
Benzo(a)Anthracene	✓	✓	✓
Benzo(a)Pyrene	✓	✓	✓
Benzo(b)Fluoranthene	✓	✓	✓
Benzo(g,h,i)Perylene	✓	✓	✓
Benzo(k)Fluoranthene	✓	✓	✓
Chrysene	✓	✓	✓
Dibenz(a,h)anthracene	✓	✓	✓
Fluoranthene	✓	✓	✓
Fluorene	✓	✓	✓
Indeno(1,2,3-cd)pyrene	✓	✓	✓
Methylnaphthalene, 2-	--	✓	✓
Naphthalene	--	✓	--
Phenanthrene	✓	✓	✓
Pyrene	✓	✓	✓
Pesticides/PCBs			
Aroclor 1254	--	✓	--
Aldrin	✓	--	--
Endrin	✓	✓	--

Table 2-2 – Summary of Constituents Detected in Each Depth Interval

Constituent	Soil Depth ≤ 1 Foot BGS	Soil Depth >1 Foot and ≤ 15 Feet BGS	Soil Depth > 15 Feet BGS
Semi-Volatiles			
Benzoic Acid	✓	✓	--
Bis(2-ethylhexyl)Phthalate	--	✓	✓
Butyl Benzyl Phthalate	--	✓	--
Dibutyl Phthalate	--	✓	--
Diethyl Phthalate	--	✓	--
Di-N-Octylphthalate	--	✓	✓
Volatiles			
Ethyl Benzene	--	✓	--
Methyl Ethyl Ketone	--	✓	--
Tetrachloroethene	--	✓	--
Xylenes	--	✓	--

Notes:

(1) This includes Bunker C and heavy oil.

(2) Oil and Grease data (EPA Method 413.2) were excluded from further evaluation in the risk assessment due to the non-specificity of the analysis method. This method measures natural oils and greases in addition to petroleum constituents.

-- Not detected in this depth interval.

Table 2-3 – Constituents That Exceed Risk-Based Screening Concentrations for Soil ≤ 1 Foot BGS

Constituent	Maximum Detected Concentration (mg/kg)	MTCA Method B Soil Screening Concentration (mg/kg) ⁽¹⁾	MTCA Method B Soil Screening Concentration Protective of Groundwater (mg/kg) ⁽²⁾	Screening Level Exceeded
Explosives				
Dinitrotoluene, 2,4-	0.87	160	1.5 ⁽³⁾	No
Dinitrotoluene, 2,6-	0.52	80	1.5 ⁽³⁾	No
Nitrobenzene	0.08	40	0.0511	Yes
Nitroglycerine	1.1			NV
Trinitrotoluene, 2,4,6-	0.64	33.3	1.75 ⁽³⁾	No
Petroleum Hydrocarbons				
Gasoline	12	100 ⁽⁴⁾		No
TPH (418.1)	10,000	2,000 ⁽⁴⁾		Yes
Inorganics				
Aluminum	24,000			NV
Antimony (metallic)	3.3	32		No
Arsenic (inorganic)	970	0.67	92,400 ⁽⁵⁾	Yes
Beryllium	0.78	160		No
Cadmium	20	80	2.21	Yes
Chromium	120	120,000		No
Copper	190	2,960		No
Lead (and compounds)	25,000	118 ⁽⁶⁾	162,000 ⁽⁵⁾	Yes
Mercury (inorganic)	130	24	24 ⁽³⁾	Yes
Nickel (soluble salts)	26	1,600	417	No
Selenium (and compounds)	2.3	400	8.32	No
Silver	1.2	400		No
Thallium	1.7	5.6		No
Zinc and Compounds	1,700	24,000	5,970	No
PAHs				
Anthracene	1.1	24,000	1,140	No
Benzo(a)Anthracene	8.6	0.14	34.3 ⁽³⁾	Yes
Benzo(a)Pyrene	5.6	0.14	34.3 ⁽³⁾	Yes
Benzo(b)Fluoranthene	7	0.14	34.3 ⁽³⁾	Yes
Benzo(g,h,i)Perylene	4.9			NV
Benzo(k)Fluoranthene	2.6	0.14	34.3 ⁽³⁾	Yes
Chrysene	14	0.14	34.3 ⁽³⁾	Yes
Dibenz(a,h)anthracene	0.51	0.14	34.3 ⁽³⁾	Yes
Fluoranthene	29	3,200	631	No
Fluorene	0.02	3,200	101	No
Indeno(1,2,3-cd)pyrene	1.6	0.14	34.3 ⁽³⁾	Yes
Phenanthrene	7.1			NV
Pyrene	9.1	2,400	655	No
Pesticides/PCBs				

Table 2-3 – Constituents That Exceed Risk-Based Screening Concentrations for Soil \leq 1 Foot BGS

Constituent	Maximum Detected Concentration (mg/kg)	MTCA Method B Soil Screening Concentration (mg/kg) ⁽¹⁾	MTCA Method B Soil Screening Concentration Protective of Groundwater (mg/kg) ⁽²⁾	Screening Level Exceeded
Aldrin	0.6	0.06	0.005	Yes
Endrin	0.02	24	1.06	No
Semi-Volatiles				
Benzoic Acid	0.27	320,000	257	No

Notes:

Shaded rows identify constituents with maximum concentrations that exceed ecological or human health screening values.

NV= No screening value was available.

⁽¹⁾The derivation of these values is presented in WAC 173-340-740.

⁽²⁾The derivation of these values is presented in WAC 173-340-747.

⁽³⁾Value is a Site-specific value designated by Ecology for the protection of groundwater. The site-specific value for Total DNT is 3.0 mg/kg. For the purposes of screening the value was divided by 2 and used as a screening criterion for 2,4 and 2,6-dinitrotoluene. For carcinogenic PAHs, the Site-specific value was 240 mg/kg for total carcinogenic PAHs; when this value is divided by 7 (there are seven carcinogenic PAHs), the value for each individual carcinogenic PAH becomes 34.3.

⁽⁴⁾Value is from MTCA Method A Table, presented in WAC 173-340-740.

⁽⁵⁾Value is a Site-specific value based on Site-specific leaching Studies (Hart Crowser, 1996).

⁽⁶⁾Value is an ecological screening concentration identified by Ecology.

Table 2-4 – Constituents That Exceed Risk-Based Screening Concentrations for Soil > 1 Foot and ≤ 15 Feet BGS

Constituent	Maximum Detected Concentration (mg/kg)	MTCA Method B Soil Screening Concentration (mg/kg) ⁽¹⁾	MTCA Method B Soil Screening Concentration Protective of Groundwater (mg/kg) ⁽²⁾	Screening Level Exceeded
Explosives				
Dinitrotoluene, 2,4-	1	160	1.5 ⁽³⁾	No
Dinitrotoluene, 2,6-	1.1	80	1.5 ⁽³⁾	No
Monomethylamine Nitrate	30,000			NV
Nitrobenzene	0.17	40	0.05	Yes
Nitroglycerine	3.7			NV
Trinitrobenzene, 1,3,5-	0.24	214,000		No
Trinitrotoluene, 2,4,6-	42	33.3	1.75 ⁽³⁾	Yes
Petroleum Hydrocarbons				
#2 Diesel	1,000	2,000 ⁽⁴⁾		No
Gasoline	87	100 ⁽⁴⁾		No
TPH (418.1)	36,000	2,000 ⁽⁴⁾		Yes
Inorganics				
Aluminum	26,200			NV
Antimony (metallic)	4	32		No
Arsenic (inorganic)	1,500	0.667	92,400 ⁽⁵⁾	Yes
Beryllium	0.7	160		No
Cadmium	2.9	80	2.21	Yes
Chromium	55	120,000		No
Copper	24,000	2,960	263	Yes
Lead (and compounds)	4,000	118 ⁽⁶⁾	162,000 ⁽⁵⁾	Yes
Mercury (inorganic)	13	24	24 ⁽³⁾	No
Nickel (soluble salts)	100	1,600	417	No
Selenium (and compounds)	0.27	400	8.32	No
Silver	1.5	400		No
Zinc and Compounds	1,100	24,000	5,970	No
PAHs				
Anthracene	0.07	24,000	1,140	No
Benzo(a)Anthracene	0.23	0.14	34.3 ⁽³⁾	Yes
Benzo(a)Pyrene	0.22	0.14	34.3 ⁽³⁾	Yes
Benzo(b)Fluoranthene	0.15	0.14	34.3 ⁽³⁾	Yes
Benzo(g,h,i)Perylene	0.1			NV
Benzo(k)Fluoranthene	0.17	0.14	34.3 ⁽³⁾	Yes
Chrysene	0.36	0.14	34.3 ⁽³⁾	Yes
Dibenz(a,h)anthracene	0.12	0.14	34.3 ⁽³⁾	No
Fluoranthene	0.36	3,200	631	No
Fluorene	0.01	3,200	101	No
Indeno(1,2,3-cd)pyrene	0.14	0.14	34.3 ⁽³⁾	Yes

Table 2-4 – Constituents That Exceed Risk-Based Screening Concentrations for Soil > 1 Foot and ≤ 15 Feet BGS

Constituent	Maximum Detected Concentration (mg/kg)	MTCA Method B Soil Screening Concentration (mg/kg) ⁽¹⁾	MTCA Method B Soil Screening Concentration Protective of Groundwater (mg/kg) ⁽²⁾	Screening Level Exceeded
Methylnaphthalene, 2-	0.04			NV
Naphthalene	0.4	1,600	4.46	No
Phenanthrene	0.2			NV
Pyrene	0.54	2,400	655	No
Pesticides/PCBs				
Aroclor 1254	0.58	1.6		No
Endrin	0.85	24	1.06	No
Semi-Volatiles				
Benzoic Acid	0.08	320,000	257	No
Bis(2-ethylhexyl)Phthalate	6.21	71.4	13.9	No
Butyl Benzyl Phthalate, N-	0.26	16,000	893	No
Dibutyl Phthalate	0.25	8,000	56.5	No
Diethyl Phthalate	2.7	64,000	72.2	No
Di-N-Octylphthalate	0.63	1,600	532,000	No
Volatiles				
Ethyl Benzene	1.5	8,000	6.91	No
Methyl Ethyl Ketone	0.41	48,000		No
Tetrachloroethene	0.06	19.6	0.009	Yes
Xylenes	2.8	160,000	135	No

Notes:

Shaded rows identify constituents with maximum concentrations that exceed ecological or human health screening values.

NV= No screening value was available.

⁽¹⁾The derivation of these values is presented in WAC 173-340-740.

⁽²⁾The derivation of these values is presented in WAC 173-340-747.

⁽³⁾Value is a Site-specific value designated by Ecology for the protection of groundwater. The site-specific value for Total DNT is 3.0 mg/kg. For the purposes of screening the value was divided by 2 and used as a screening criterion for 2,4 and 2,6-dinitrotoluene. For carcinogenic PAHs, the Site-specific value was 240 mg/kg for total carcinogenic PAHs; when this value is divided by 7 (there are seven carcinogenic PAHs), the value for each individual carcinogenic PAH becomes 34.3.

⁽⁴⁾Value is from MTCA Method A Table, presented in WAC 173-340-740.

⁽⁵⁾Value is a Site-specific value based on Site-specific leaching Studies (Hart Crowser, 1996).

⁽⁶⁾Value is an ecological screening concentration identified by Ecology.

Table 2-5 – Constituents That Exceed Risk-Based Screening Concentrations for Soil > 15 Feet BGS

Constituent	Maximum Detected Concentration (mg/kg)	MTCA Method B Soil Screening Concentration Protective of Groundwater (mg/kg) ⁽¹⁾	Screening Level Exceeded
Explosives			
Dinitrotoluene, 2,4-	0.95	1.5 ⁽²⁾	No
Dinitrotoluene, 2,6-	1.90	1.5 ⁽²⁾	Yes ⁽³⁾
Trinitrobenzene, 1,3,5-	0.62		NV
Trinitrotoluene, 2,4,6-	7.40	1.75 ⁽²⁾	Yes
Petroleum Hydrocarbons			
#2 Diesel	660		NV
TPH (418.1)	11,000	7,600 ⁽⁴⁾	Yes
Inorganics			
Aluminum	11,400		NV
Arsenic (inorganic)	18	92,400 ⁽⁵⁾	No
Beryllium	0.2		NV
Cadmium	0.14	2.21	No
Chromium	13.5		NV
Copper	22	263	No
Lead (and compounds)	1,800	162,000 ⁽⁵⁾	No
Mercury (inorganic)	0.14	24 ⁽²⁾	No
Nickel (soluble salts)	18	417	No
Silver	0.3		NV
Zinc and Compounds	63	5,970	No
PAHs			
Acenaphthene	0.04	105	No
Anthracene	0.07	1,140	No
Benzo(a)Anthracene	0.20	34.3 ⁽²⁾	No
Benzo(a)Pyrene	0.23	34.3 ⁽²⁾	No
Benzo(b)Fluoranthene	0.16	0.14	No
Benzo(g,h,i)Perylene	0.21		NV
Benzo(k)Fluoranthene	0.10	34.3 ⁽²⁾	No
Chrysene	0.28	34.3 ⁽²⁾	No
Dibenz(a,h)anthracene	0.19	34.3 ⁽²⁾	No
Fluoranthene	0.36	631	No
Fluorene	0.04	101	No
Indeno(1,2,3-cd)pyrene	1.10	34.3 ⁽²⁾	No
Methylnaphthalene, 2-	0.04		NV
Phenanthrene	0.54		NV
Pyrene	0.63	655	No
Semi-Volatiles			
Bis(2-ethylhexyl)Phthalate	0.04	13.9	No

Table 2-5 – Constituents That Exceed Risk-Based Screening Concentrations for Soil > 15 Feet BGS

Constituent	Maximum Detected Concentration (mg/kg)	MTCA Method B Soil Screening Concentration Protective of Groundwater (mg/kg)⁽¹⁾	Screening Level Exceeded
Di-N-Octylphthalate	0.14	532,000	No

⁽¹⁾The derivation of these values is presented in WAC 173-340-747.

⁽²⁾Value is a Site-specific value designated by Ecology for the protection of groundwater. The site-specific value for Total DNT is 3.0 mg/kg. For the purposes of screening the value was divided by 2 and used as a screening criterion for 2,4 and 2,6-dinitrotoluene. For carcinogenic PAHs, the Site-specific value was 240 mg/kg for total carcinogenic PAHs; when this value is divided by 7 (there are seven carcinogenic PAHs), the value for each individual carcinogenic PAH becomes 34.3.

⁽³⁾The site-specific cleanup level that is protective of groundwater and human health for total DNT is 3.0 mg/kg.

⁽⁴⁾Site-specific value that is protective of groundwater and human health for Bunker C fuel oil.

⁽⁵⁾Site-specific value that is protective of groundwater based on site-specific leaching studies (Hart Crowser, 1996).

Table 2-6 – Summary of Constituents That Exceeded Soil-to-Groundwater Screening Criteria in Each Depth Interval

Constituent	Soil Depth \leq 1 Foot BGS	Soil Depth >1 Foot and \leq 15 Feet BGS	Soil Depth > 15 Feet BGS
Explosives			
Dinitrotoluene, 2,6-	--	--	✓
Nitrobenzene	✓	✓	--
Trinitrotoluene, 2,4,6-	--	✓	✓
Inorganics			
Cadmium	✓	✓	--
Petroleum Hydrocarbons			
TPH (418.1) [Bunker C Fuel Oil]	✓	--	✓
Copper	--	✓	--
Mercury (inorganic)	✓	--	--
Pesticides/PCBs			
Aldrin	✓	--	--
Volatiles			
Tetrachloroethene	--	✓	--

Note:

-- Not a COPC for this depth interval.

Table 2-7 – Summary of Constituents to be Evaluated in Risk Assessment for Each Depth Interval

Constituent	Soil Depth ≤ 1 Foot BGS	Soil Depth > 1 Foot and ≤ 15 Feet BGS
Explosives		
Monomethylamine Nitrate	--	✓
Nitroglycerine	✓	✓
Trinitrotoluene, 2,4,6-	--	✓
Petroleum Hydrocarbons		
TPH (418.1)	✓	✓
Inorganics		
Aluminum	✓	✓
Arsenic	✓	✓
Copper	--	✓
Lead	✓	✓
Mercury	✓	--
PAHs		
Benzo(a)Anthracene	✓	✓
Benzo(a)Pyrene	✓	✓
Benzo(b)Fluoranthene	✓	✓
Benzo(g,h,i)Perylene	✓	✓
Benzo(k)Fluoranthene	✓	✓
Chrysene	✓	✓
Dibenz(a,h)anthracene	✓	--
Indeno(1,2,3-cd)pyrene	✓	✓
Methylnaphthalene, 2-	--	✓
Phenanthrene	✓	✓
Pesticides/PCBs		
Aldrin	✓	--

Notes:

Shaded rows identify COPCs with no available MTCA risk-based screening values. These COPCs are carried through the risk assessment.

-- Not a COPC for this depth interval.

Figure 2-1 – Parcel 1 Future Land Use

Figure 2-2 – Risk Assessment Evaluation Units

Figure 2-3 – Comparison of RI Areas and RA Evaluation Units

2.6 References

Ecology (Washington State Department of Ecology). 2001. Cleanup Levels and Risk Calculation (CLARC) Table Updates, Version 3.1, November. 2001.

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